

A photograph of three wind turbines on a grassy hilltop, with a hazy landscape and mountains in the background. The image is partially obscured by a dark grey circular graphic on the right side of the slide.

# Roadmap for high RES penetration in Greek Non Interconnected Islands

*European Forum on Clean  
Energy for Islands*

*Prof. Nikos Chatziargyriou  
Chairman*

*Naxos, 9-11 of July 2018*

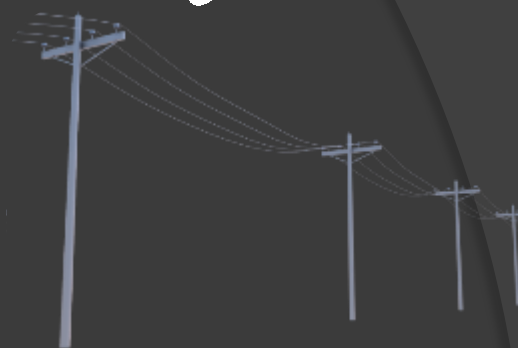
# Who we are and what we do



7,000 employees



7,5 million customers



Total network length 238,000

*HEDNO was established in **May 2012** after the spin – off of the Distribution Department of PPC S.A.*

Turnover is 900 million € (2017)  
Average Annual Investment is 190 million € (2016-2017)



RES capacity:  
3,728 plants, 60 MW

**HEDNO** is among the **10 largest Electricity Distribution Operators in EU** (based on the number of consumers and the total length of its network)

# What we do



Delivering uninterrupted electricity to 7,47 million consumers across the country through Medium and Low Voltage networks.

Managing the High Voltage networks in Attica and the Islands.

Our fundamental tasks are **to ensure**:

- The efficient **Operation, Maintenance & Development of the country's Distribution Network**
- The management of the Non-Interconnected Islands electricity systems
- **Unhindered access** to our Network by all energy consumers and dispersed generators
- Facilitate the smooth operation of electricity supply market



# Our vision and strategy



## Vision

Our VISION is to become one of the top 10 Distribution Network Operator in Europe achieving the optimal combination of **QUALITY** and **LOW-COST SERVICES**, respecting **ENVIRONMENTAL PROTECTION**.

## Investment Plan

Our 5 year INVESTMENT PLAN foresees a total budget of €1,2 billion and includes projects for reinforcing and modernizing the Distribution Network with a core of 13 fundamental strategic projects.



## Strategy

Our STRATEGY aims to the integration of modern technologies (“Smart Grids”, Remote Metering, Remote Services, Automations etc)

## Goal

Our GOAL is to modernize the Distribution Network and transform it into a “Smart System” that will continually optimize the management of the connected consumers and producers, covering their emerging needs by an optimal techno-economical way.

# The road to our digital transformation



Monitoring of MV substations and Network

Smart Meters

...2030 Continuing our digital transformation

GIS planning

Remote Control

Customer Service

Cyber security

EV

Start Ups

2021 Projects Concluded

Internet of things

big data

2014 Transformation Plan

Smart Islands

13 strategic projects

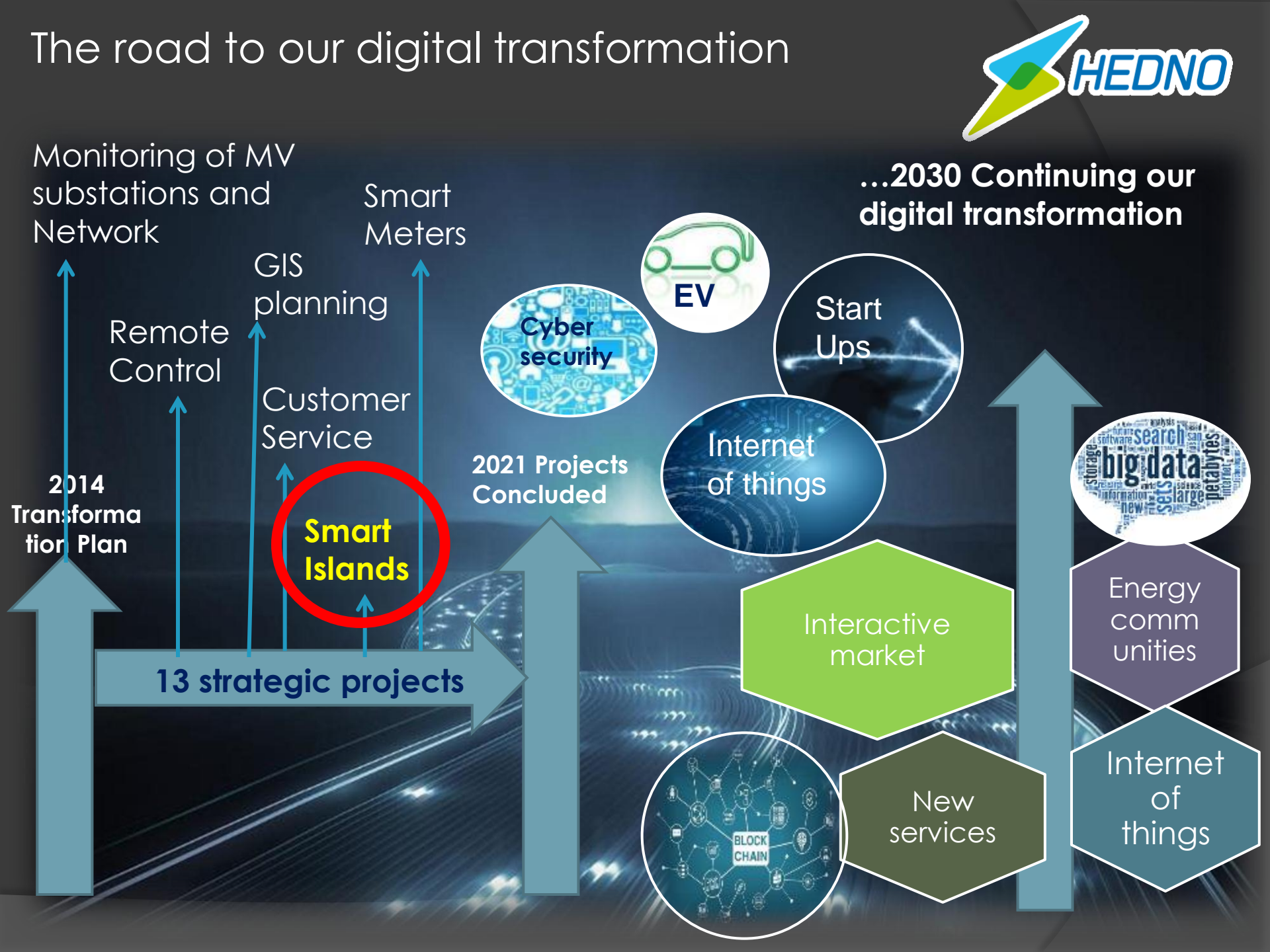
Interactive market

Energy communities

New services

Internet of things

BLOCK CHAIN





# HEDNO is the electrical System Operator of the Non Interconnected Islands (NII)



60 Islands -32 Electrical Systems  
They account for almost 14% of total national annual electricity consumption

Market Operator

Manager and Operator of Energy Control Centers



Distribution System Operator

Transmission System Operator

# Non Interconnected Islands (NII) structure



- Host 15% of the Greek population and account for almost 14% of the total national annual electricity consumption (~43,000 GWh/year)\*

• Data based in 2017

- 32 Electrical Systems (ES)

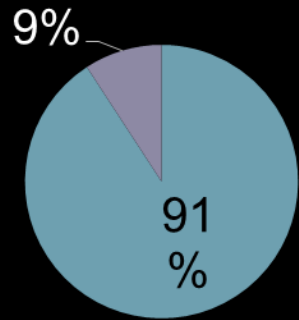
- 11 ES consisting of 39 interconnected islands
- 21 ES consisting of autonomous islands
- 31 Isolated Microgrids
- 1 Small Isolated System (Crete)

Categorized by **Average Peak Demand (APD)** [last 5 years]

- **Large** (APD > 100MW): 2 ES
- **Medium** (5MW < APD ≤ 100MW): 14 ES
- **Small** (APD ≤ 5MW): 16 ES

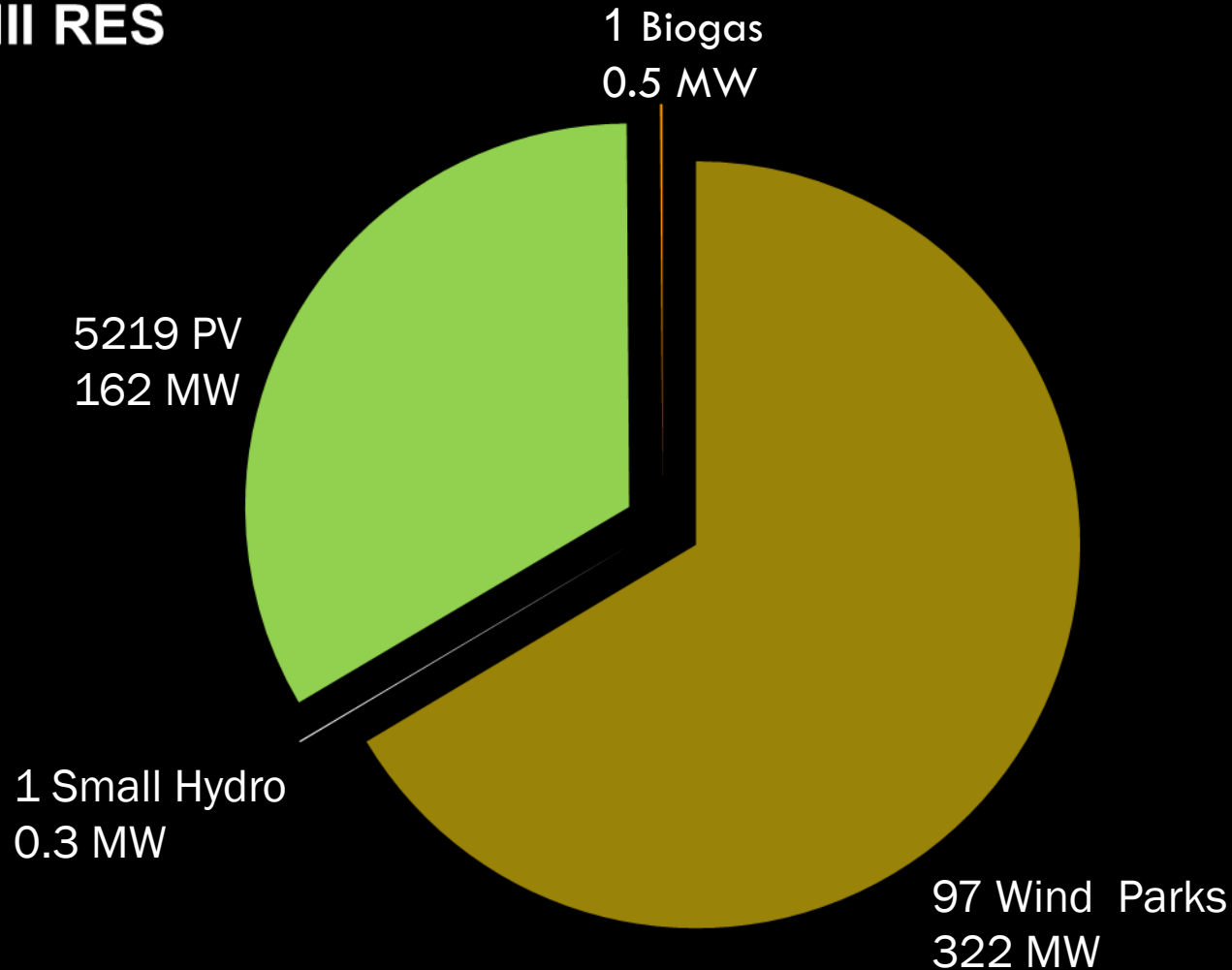
# Installed RES in NII

## RES - Greece

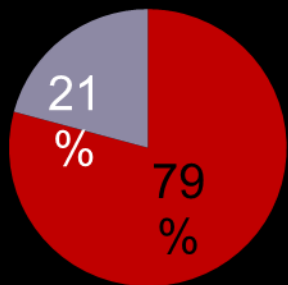


■ Mainland (4779 MW)
 ■ NII (485 MW)

## NII RES



## Power Mix - NII



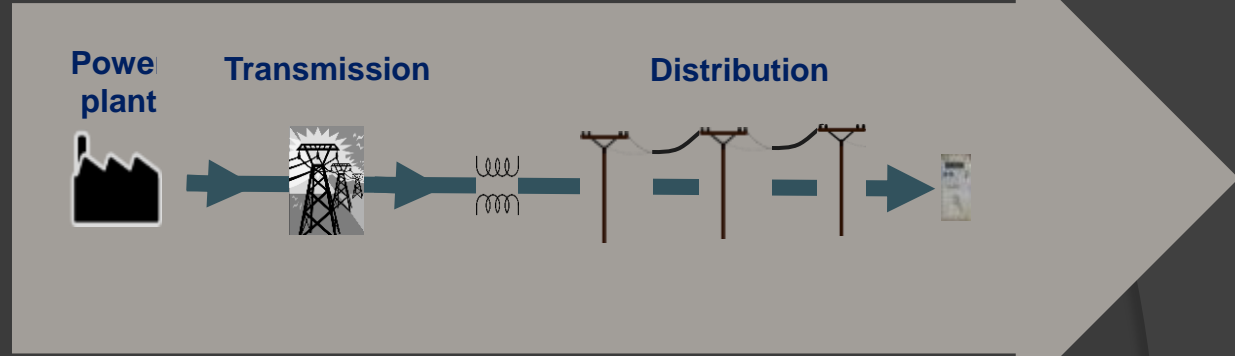
■ Thermal (1845 MW)
 ■ RES (485 MW)



# NII's within HEDNO's transformation

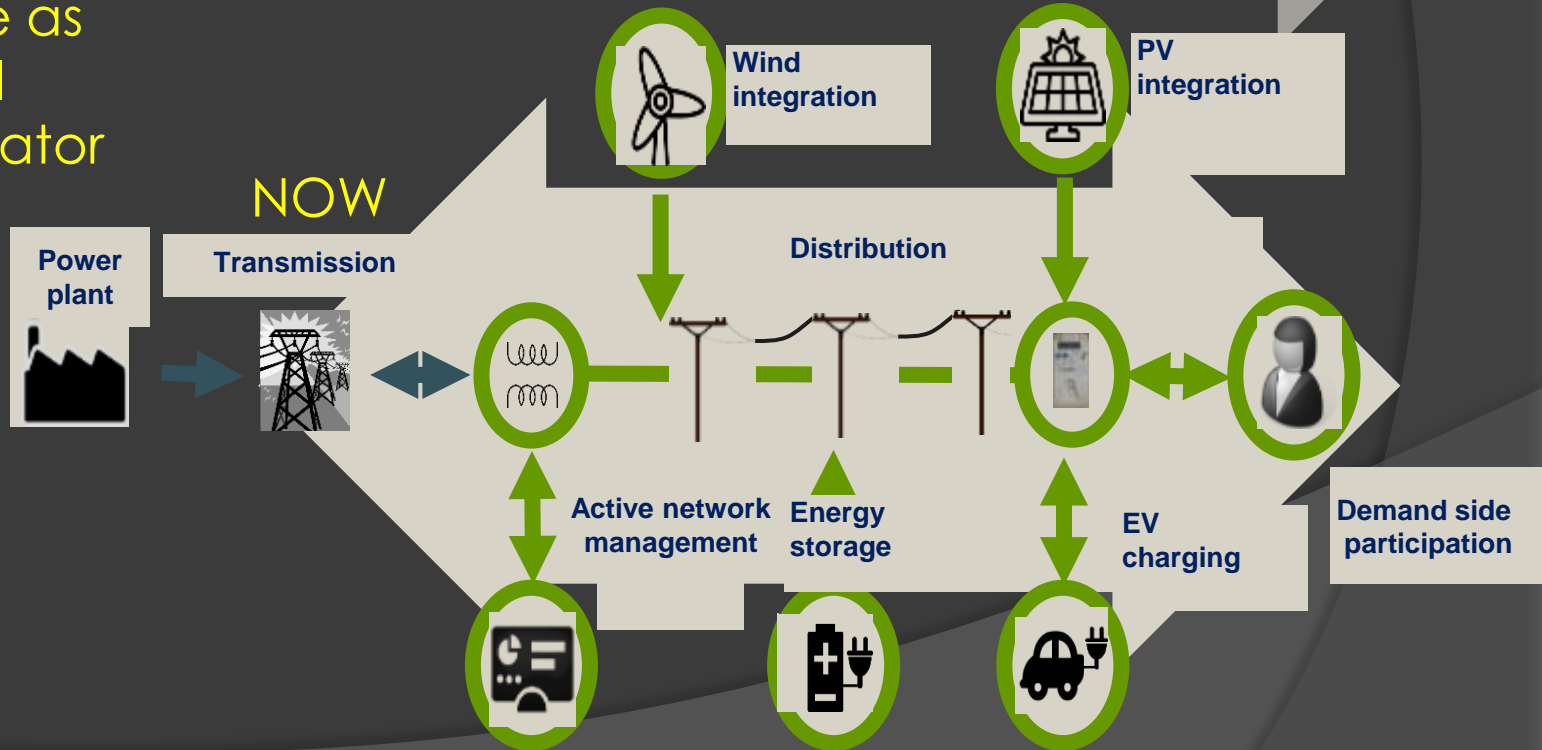


## BEFORE

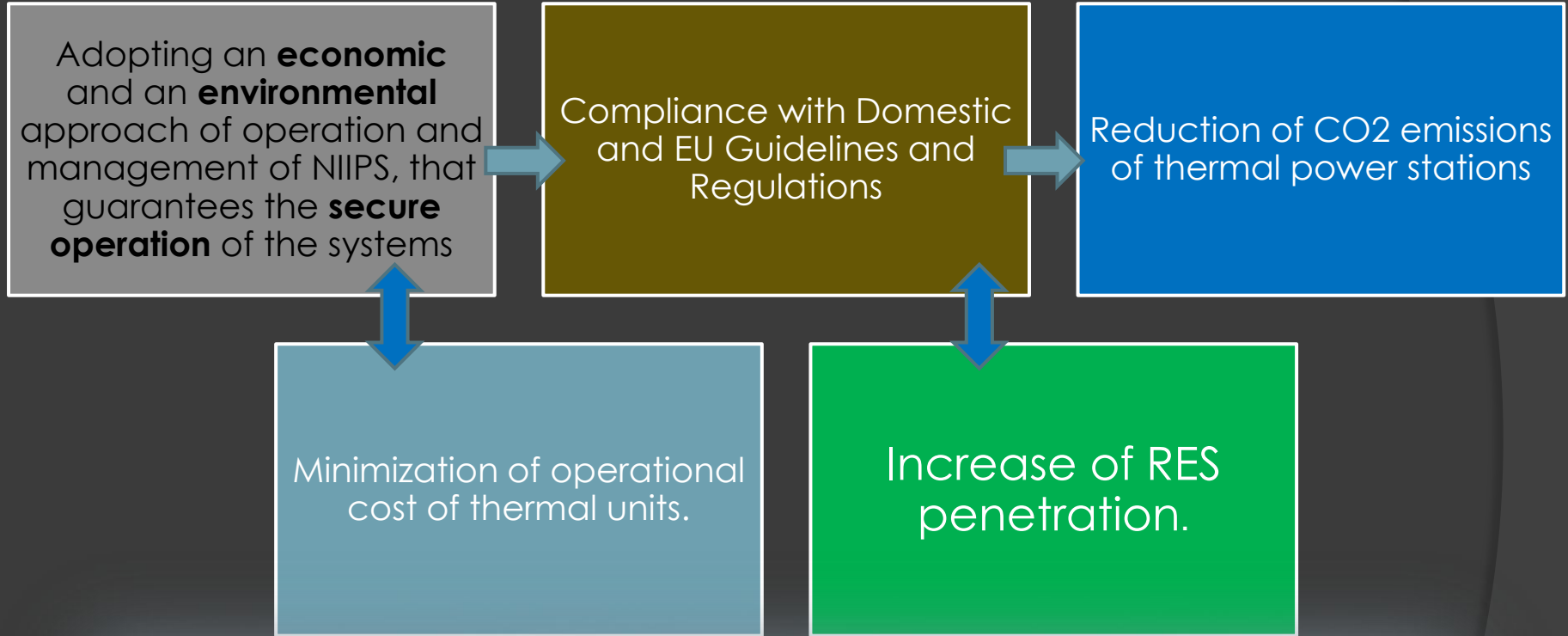


Adaptation to the upcoming challenges of HEDNO's role as NII's Electrical System Operator (ESO).

## NOW



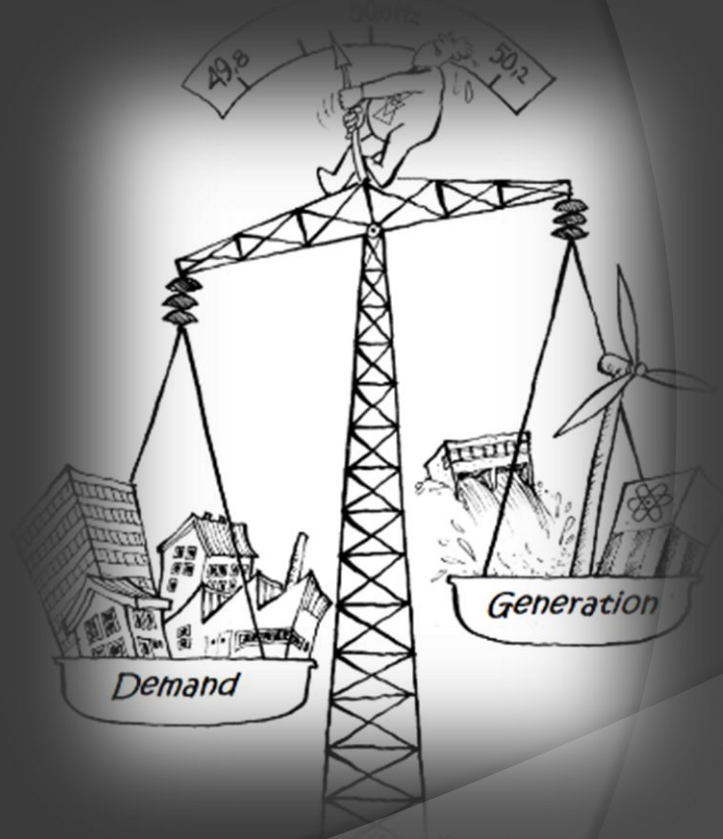
# HEDNO's major goals in the NIIs



# HEDNO's major challenges in NIs



- ❑ Islands of different size, population and distance from the Mainland, without easy access at any time especially by the sea
- ❑ Isolated ES, without energy exchange ability, with direct effects on ensuring the availability of energy supply
- ❑ Due to lack of interconnections with electrical systems of high inertia, NIs ES face problems of voltage and frequency stability

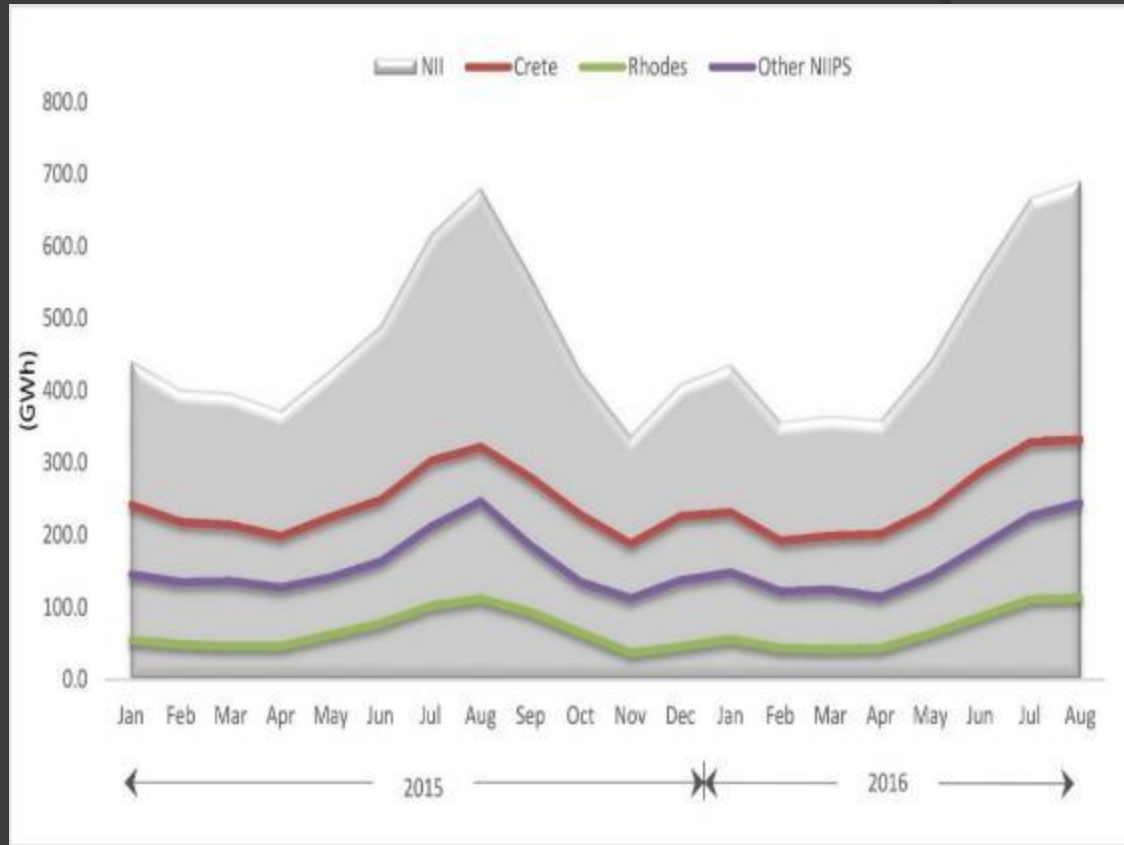


# HEDNO's major challenges in the NIIs



- ❑ High fluctuations of demand on daily and monthly basis.

Difficulties in Generation Planning, possible need for capacity assurance mechanisms



Monthly Load 2015 – 2016(Aug) of NIIPS

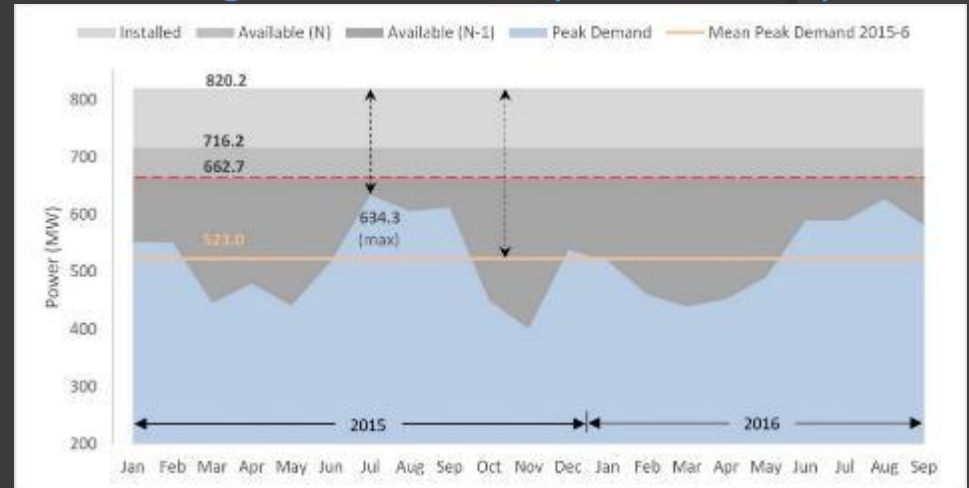
# HEDNO's major challenges in the NII's



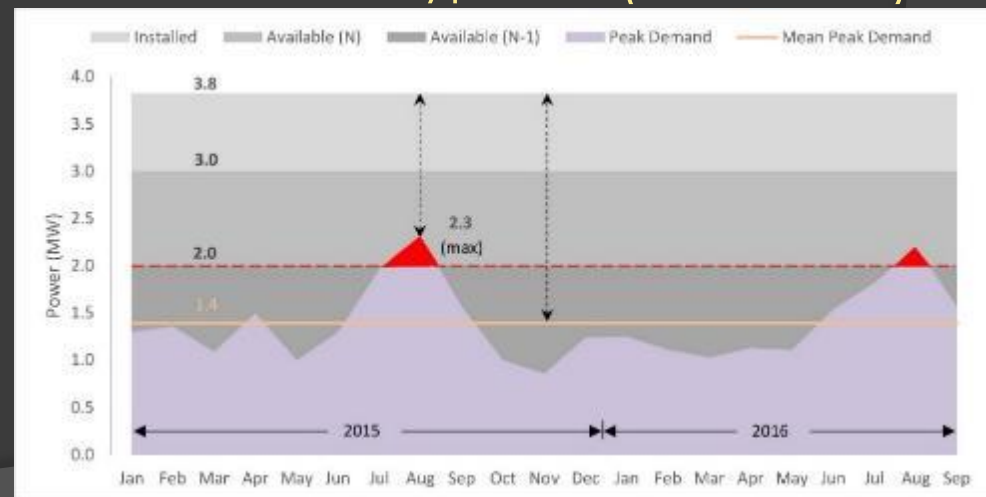
- ❑ Common characteristic of all NII's is the seasonal peak demand due to tourism.

Need to operate with excessive thermal capacity installed throughout the year and in some cases to add emergency power capacity in order to meet peak demand.

## Large ES: Crete (2015-2016)



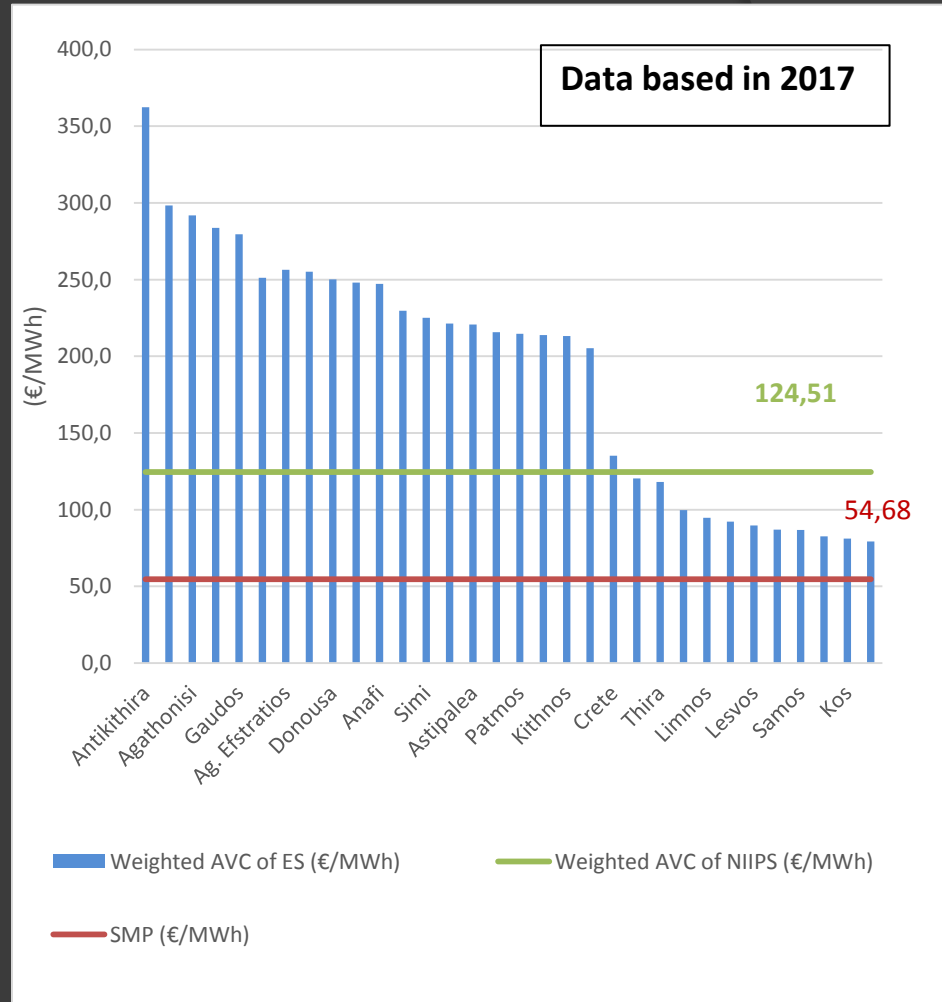
## Small ES: Astypalea (2015-2016)



# HEDNO's major challenges in the NIIs



- Average Variable Cost (AVC) substantially higher (up to 6 times) than the average System Margin Price (SMP) of the mainland Grid







## HEDNO's Core Infrastructure



HEDNO's Core Infrastructure

- Modernize Network Control Centers
- Further implementation of Smart Metering
- Set up Geographic Information System (GIS)
- Set up electronic Customer Service System (Call Centers)
- Upgrade Network Planning
- Re-organize Supply Chain
- Integrated System for Digitalization and Data Management

# Roadmap for NIIs



HEDNO's Core Infrastructure



NII's Infrastructure

- Methodological Infrastructure
- Metering Infrastructure for generation units
- Energy Control Centers (ECC)
- Development of the IT System for NII
- Implementation of pilot **Smart Islands**

(tender 2018)

2021

**NIIs Infrastructure**  
(2 projects)

# Energy Control Centers



## Projects in Progress

- Tender for the implementation of central ECC (Athens) and local ECC (Rhodes)
- Implementation of SCADA-EMS in 27 ES

## Benefits

- ES operation optimization and cost reduction
- Increase of RES penetration
- Facilitate market operation with more transparency



# Energy Control Centers (ECC)



## Central ECC (Athens)



### MMS

- Load/RES forecasting
- RDAS
- DS



**Corporate Infrastructure:**  
(IMS, Data Warehouse,  
Helpdesk)

## Local ECCs

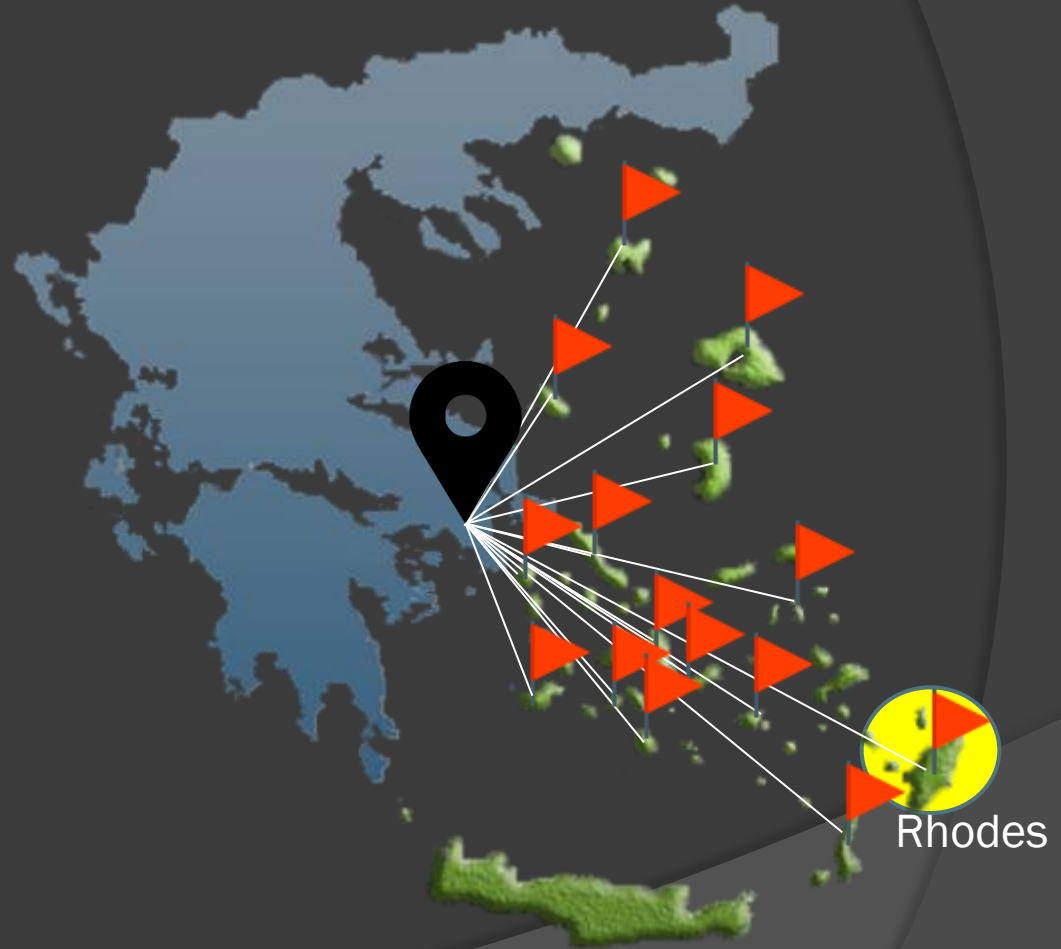


### MMS

**(Backup)**



**EMS (Real-time  
dispatch)**



## Smart Metering in Nlls

### Smart Metering in Production Units

- All RES units (except PVs) metering – *Completed*
- Thermal units metering – *Under Progress*

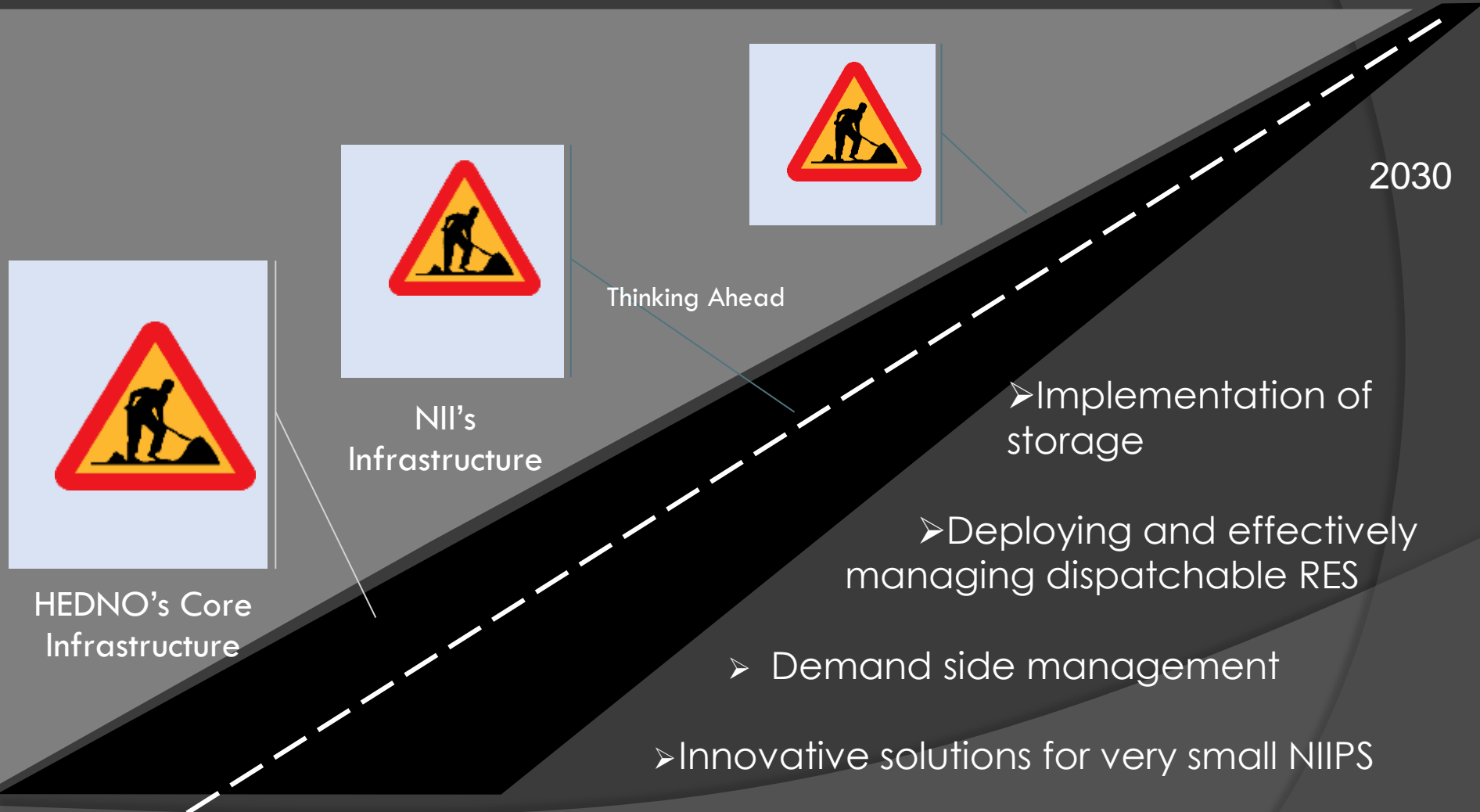
### Smart Metering in Customers

- MV and large LV customers metering – *Completed*
- All LV customers metering – *On-going, Business Model*





# Roadmap – Thinking ahead



HEDNO's Core Infrastructure

NII's Infrastructure

Thinking Ahead

- Implementation of storage
- Deploying and effectively managing dispatchable RES
- Demand side management
- Innovative solutions for very small NIIPS

2030



We connect  
People  
Businesses  
Infrastructures  
Information  
Technologies

*Thank you very  
much*